Atmospheric Water Vapor **Transport by Volcanic Plumes**

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Large, explosive volcanic eruptions transport particulate ash and volcanic gases into the stratosphere. The resulting eruption columns are mainly composed of entrained air that is incorporated into the plume and is redistributed throughout the atmosphere. Significant quatntities of ambient atmospheric water vapor can be transported by volcanic plumes to higher levels in the atmosphere. While the consequences of SO_2 injection into the stratosphere have been studied for several years, the effects of water vapor entrained at lower atmospheric levels have been largely ignored. The injection of water vapor may have an important effect on stratospheric chemistry processes due to the. extremely low background levels of water vapor. Observations of ire-cased levels (up to two orders of magnitude) of stratospheric water vapor were reported following the eruptions of Mount St. Helens (Turco *et al.*, 1983). We have used a three component mode] for buoyant plumes that accounts separtely for dry air, water vapor, anti condensates or particulates. This model includes a phase change for water vapor condensation at prescribed rates. The liberation of latent heat affects the thermal balance in the colmn, the dime. nsions of the plume, and the redistribution of ambient water vapor throughout the atmosphere. By assuming initial heat flux values comparable to ash producing eruptions, wc can approximate the transport capabilities of volcanic plumes. Using this model we estimate the amount of water vapor transported to the top of the plume and the amount that condensed during transport. Preliminary estimates indicate that a 12 km high plume erupted into a moist tropical atmosphere could entrain as much as 2×10^5 kg of water vapor during the rise of a single control volume. Assuming a condensation rate. much longer than the plume rise time, 20% of that water vapor may condense by the time it reaches the top of the plume. Much faster condensation rates result in almost complete condensation of the water vapor.

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